

CHEE 210

Tutorial 3

Friday January 27, 2012 Grp A 14:30 Dup217

Monday January 30, 2012 Grp B 13:30 Ellis 324

1. Air is composed of approximately 71% nitrogen and 29% oxygen. Given that gamma for air is $\gamma = 1.4$, show that, for air at atmospheric conditions. $C_p = 7/2R$.
2. 1 m^3 of an ideal diatomic gas at 600 K and 1000 kPa expands to 5 times its initial volume as follows:
 - a) by a frictionless, reversible, isothermal process
 - b) by a frictionless, reversible, adiabatic process

For each process calculate the final temperature, final pressure, the total work done and total heat exchanged and the change in total internal energy, change in total enthalpy.

3. Recall that for real gases we can account for non-ideal behavior by defining a compressibility factor $Z = (V_{\text{Real}} / V_{\text{ideal}})$ where we can use Z as a correction factor in the ideal gas law such that $PV = ZRT$. Using the same starting point as was used for ideal gases, derive an equation for the work of a mechanical reversible isothermal compression of a gas from an initial pressure P_1 to a final pressure P_2 using the compressibility factor in the form from the virial equation:

$$Z = 1 + B'P$$

How does this result compare to the corresponding equation for an ideal gas?